

$$P_o = 490^k$$

$$M_{ox} = 90^k \times 1.5' = 135 \text{ k-FT}$$

$$M_{oy} = \frac{50^k \times 24}{4} = 300 \text{ k-FT}$$

$$P_r = P_{nt} + B_2 P_{et}$$

$$M_r = B_1 M_{nt} + B_2 M_{et}$$

$$\frac{Y\text{-AXIS}}{B_1} = \frac{C_m}{1 - \alpha P_r / P_{e1}}$$

$$C_m = 1 - 0.2 \frac{\alpha P_r}{P_{e1}} \quad \leftarrow \text{C-A-8.1}$$

$$P_{e1} = \frac{\pi^2 E (I_y = 931)}{(K_1 \times L = 1.0 \times 24 \times 12)^2}$$

$$= 3212$$

$$I_x = 2400$$

$$C_m = 1 - 0.2 \times 490 / 3212 = 0.97$$

$$B_1 = \frac{0.97}{1 - \frac{490}{3212}} = 1.14$$

$$M_{ry} = 1.14 \times 300 \text{ k-FT} = 342 \text{ k-FT}$$

HR

D

$$B_x \Rightarrow C_m = 0.6 - 0.4 \left(\frac{0}{35} \right) = 0.6$$

$$P_{e1x} = \frac{\pi^2 E (I_x = 2400)}{(1 \times 24 \times 12)^2} = 8281$$

$$B_1 = \frac{0.6}{1 - 490 / (P_{e1} = 8281)} = 0.64 \geq 1.0$$

$$M_{rx} = 135 \text{ k-FT}$$

$$C_{bx} = \frac{1.0}{135} \times \frac{(1)}{2} \times 12.5 \times 135$$

$$2.5 + 0.25 \times 3 + 0.5(4) + 0.75(3) = 1.67$$

$$b_x = \frac{0.709}{1.67} = 0.426 \geq 0.668 \times 10^{-3}$$

$$p = 0.566 \times 10^{-3}$$

$$b_y = 1.32 \times 10^{-3}$$

$$p_r = 0.566 \times 440 = 0.28 > 0.2$$

$$p_r + b_x M_x + b_y M_y =$$

$$0.28 + (0.668 \times 10^{-3})(135) + (1.32 \times 10^{-3})(342) = 0.82 \text{ ok} \checkmark$$

PROBLEM 4

-2 if 50 ksi used

$$T = A_s F_y = 10.3 \times 70 \text{ ksi} = 721 \quad 3 \text{ points}$$

$$a = \frac{721}{0.85(5)(80)} = 2.12'' \quad 3 \text{ points}$$

$$M_n = 721^k \left(17.7/2 + 6'' - 2.12/2 \right) \\ = 9942 \text{ k-in} \quad 4 \text{ points}$$

$$\phi M_n = 0.9 \times \frac{9942}{12} = 746 \text{ k-ft} \quad 3 \text{ points}$$

$$\frac{w_L^2}{8} = 746 \text{ k-ft} \quad 2 \text{ points}$$

-2 if no 1.6 factor

$$\frac{(1.6 \times w_L) \times 80}{8} = 746 \text{ k-ft}$$

$$w_L = \frac{3.04 \text{ k/ft}}{\text{BY STRENGTH}} \quad 3 \text{ points}$$

DEFLECTION:

$$Y_{EHA} = \frac{10.3 \times \frac{17.7}{2} + \frac{721}{70} \times (17.7 + 6 - 2.12/2)}{10.3 + \frac{721}{70}} \\ = 324/20.6 = 15.7'' \quad 5 \text{ points}$$

$$I_{LB} = 510 + 103 \times \left(15.7 - \frac{17.7}{2}\right)^2 + \frac{721}{70} \left(17.7 + 6 - \frac{2.2}{2} - 15.7\right)^2$$

5 points

$$510 + 483 + 496 = 1489 \text{ in}^4$$

-2 if 1.6 factor included here

$$\Delta = L/360 = \frac{35' \times 12''}{360} = 1.17'' = \frac{5 \omega_L L^4}{384 EI}$$

$$1.17'' = \frac{5 \omega_L \times (35')^4 \times 12^3}{384 (29 \times 10^3) (1489 \text{ in}^4)}$$

4 points

$$\omega_L = \underline{\underline{1.49 \text{ k/ft}}}$$

GOVERNS
OVER
3.54 k/ft

3 points for correct conclusion